

## Complete Summary

---

### GUIDELINE TITLE

Optimizing bone health and calcium intakes of infants, children, and adolescents.

### BIBLIOGRAPHIC SOURCE(S)

Greer FR, Krebs NF. Optimizing bone health and calcium intakes of infants, children, and adolescents. Pediatrics 2006 Feb;117(2):578-85. [58 references]  
[PubMed](#)

### GUIDELINE STATUS

This is the current release of the guideline.

It updates a previously published guideline summary: American Academy of Pediatrics. Committee on Nutrition. Calcium requirements of infants, children, and adolescents. Pediatrics. 1999 Nov;104(5 Pt 1):1152-7.

All policy statements from the American Academy of Pediatrics automatically expire 5 years after publication unless reaffirmed, revised, or retired at or before that time.

## COMPLETE SUMMARY CONTENT

SCOPE  
METHODOLOGY - including Rating Scheme and Cost Analysis  
RECOMMENDATIONS  
EVIDENCE SUPPORTING THE RECOMMENDATIONS  
BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS  
QUALIFYING STATEMENTS  
IMPLEMENTATION OF THE GUIDELINE  
INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT  
CATEGORIES  
IDENTIFYING INFORMATION AND AVAILABILITY  
DISCLAIMER

## SCOPE

### DISEASE/CONDITION(S)

- Bone health
- Osteoporosis and bone fractures

### GUIDELINE CATEGORY

Management  
Prevention

#### CLINICAL SPECIALTY

Family Practice  
Nutrition  
Pediatrics  
Preventive Medicine

#### INTENDED USERS

Advanced Practice Nurses  
Dietitians  
Nurses  
Physician Assistants  
Physicians

#### GUIDELINE OBJECTIVE(S)

To present recommendations for optimizing bone health and calcium intake in infants, children, and adolescents in the United States

#### TARGET POPULATION

Infants, children, and adolescents in the United States

#### INTERVENTIONS AND PRACTICES CONSIDERED

1. Periodically assessing calcium intake and risk factors for suboptimal bone health in the office setting, including
  - Asking questions regarding dietary practices
  - Providing information regarding approximate calcium contents in one serving of some common foods
  - Assessing family history of osteoporosis
2. Encouraging weight-bearing exercise
3. Consultation with registered dietitian if necessary
4. Consideration of alternative sources of calcium if needed
5. Ensuring adequate intake of vitamin D

#### MAJOR OUTCOMES CONSIDERED

- Calcium intake
- Risk of fractures
- Calcium balance
- Bone mass and bone mineral content

### METHODOLOGY

#### METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

#### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Not stated

#### NUMBER OF SOURCE DOCUMENTS

Not stated

#### METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Expert Consensus (Committee)

#### RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Not applicable

#### METHODS USED TO ANALYZE THE EVIDENCE

Review

#### DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Not stated

#### METHODS USED TO FORMULATE THE RECOMMENDATIONS

Not stated

#### RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

#### COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

#### METHOD OF GUIDELINE VALIDATION

Peer Review

#### DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

Not stated

## RECOMMENDATIONS

### MAJOR RECOMMENDATIONS

Recommendations for Adequate Dietary Calcium Intake in the United States (Institute of Medicine, Food and Nutritional Board, 1997)

Age	Calcium Intake, mg/d (mmol/d)
0-6 months <sup>a</sup>	210 (5.3)
7-12 months <sup>b</sup>	270 (6.8)
1-3 years	500 (12.5)
4-8 years	800 (20.0)
9-18 years	1300 (32.5)
19-50 years	1000 (25)
50 to >70 years	1200 (30)

The Food and Nutrition Board of the National Academy of Sciences (NAS) released recommended dietary allowances for calcium in 1997. The term "adequate intake" was applied to calcium recommendations. Application of the adequate intake is similar to that of the recommended dietary allowance. The American Academy of Pediatrics recommends that the NAS guidelines should be the primary guidelines used.

<sup>a</sup> The 1997 NAS report used data based on younger infants (0-6 months) who are fed human milk exclusively.

<sup>b</sup> The 1997 NAS report was based on the assumption that older infants (6 months to 1 year) would be consuming a diet of human milk and solid foods, which would be similar to that of formulated infants at this age.

### Key Points

1. Pediatricians can actively promote bone health and support the goal of achieving adequate calcium intakes by children and adolescents by promoting the recommended adequate intakes of the Food and Nutrition Board of the National Academy of Sciences (NAS) (Institute of Medicine, Food and Nutritional Board, 1997) (see table above). The prevention of future osteoporosis and the possibility of a decreased risk of fractures in childhood and adolescence should be discussed with patients and families as potential benefits for achieving these goals.
2. Physical activity, primarily weight-bearing exercise, is encouraged as part of an overall healthy bone program.
3. Currently, the average dietary intake of calcium by children and adolescents (Fig 1 in the original guideline document) is well below the recommended levels of adequate intake (see table above). Information regarding calcium content of various foods should be given to patients and families for whom calcium intake seems inadequate. A registered dietitian may be consulted for a more thorough assessment of diet and to make the necessary recommendations to improve calcium.
4. Inadequate calcium intake by the child or adolescent is a family issue. Adequate intake of dietary calcium should be encouraged for all family members (see table above).

5. In the office setting, calcium intake can be assessed periodically with a simple questionnaire. Suggested ages for screening are 2 to 3 years of age, after the transition from human milk or formula; 8 to 9 years of age during preadolescence; and again during adolescence, when the peak rate of bone mass accretion occurs. Targeted questions are suggested (see Table 3 in the original guideline document) to assess calcium intake, general diet, and lifestyle practices relevant to bone health.
6. The most common sources of calcium in the Western diet are milk and other dairy products. Whole milk is not recommended until after 12 months of age, although yogurt and cheese can be introduced after 6 months. Low-fat dairy products including skim milk and low-fat yogurts are good sources of calcium. Nondairy calcium-rich foods are the next preferred source, although the calcium in soy products has low bioavailability. Calcium supplements are another alternative source, but these products do not offer the benefits of other associated nutrients, and compliance may be a problem. Most people can achieve the recommended dietary intake of calcium by eating 3 age-appropriate servings of dairy products per day (4 servings per day for adolescents) or the equivalent.
7. The diet of all infants (including those who are breastfeeding [Gartner et al., 2005]), children, and adolescents should include the recommended adequate intakes of vitamin D (200 IU [5.0 micrograms] or 500 mL of vitamin D-fortified formula or milk per day [Institute of Medicine, Food and Nutritional Board, 1997; Gartner & Greer, 2003]) as well as fruits and vegetables that are sources of potassium and bicarbonate, which may improve calcium retention.

#### CLINICAL ALGORITHM(S)

None provided

#### EVIDENCE SUPPORTING THE RECOMMENDATIONS

#### REFERENCES SUPPORTING THE RECOMMENDATIONS

[References open in a new window](#)

#### TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of evidence supporting the recommendations is not specifically stated.

#### BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

##### POTENTIAL BENEFITS

Maintaining adequate calcium intake during childhood and adolescence is necessary for the development of peak bone mass, which may be important in reducing the risk of fractures and osteoporosis later in life. Optimal calcium intake is especially relevant during adolescence, when most bone mineral accretion occurs.

## POTENTIAL HARMS

Although data on calcium toxicity in children 1 through 18 years of age are limited, high calcium intake in small children may increase the risk of zinc and iron deficiency attributable to the adverse affect of calcium on the absorption of these minerals.

## QUALIFYING STATEMENTS

### QUALIFYING STATEMENTS

The guidance in this report does not indicate an exclusive course of treatment or serve as a standard of medical care. Variations, taking into account individual circumstances, may be appropriate.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

### IMPLEMENTATION TOOLS

Patient Resources

For information about [availability](#), see the "Availability of Companion Documents" and "Patient Resources" fields below.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Staying Healthy

### IOM DOMAIN

Effectiveness  
Patient-centeredness

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

Greer FR, Krebs NF. Optimizing bone health and calcium intakes of infants, children, and adolescents. Pediatrics 2006 Feb; 117(2):578-85. [58 references]  
[PubMed](#)

### ADAPTATION

Not applicable: The guideline was not adapted from another source.

#### DATE RELEASED

1999 (revised 2006 Feb)

#### GUIDELINE DEVELOPER(S)

American Academy of Pediatrics - Medical Specialty Society

#### SOURCE(S) OF FUNDING

American Academy of Pediatrics

#### GUIDELINE COMMITTEE

Committee on Nutrition

#### COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Committee on Nutrition, 2003-2004: Nancy F. Krebs, MD, Chairperson; Robert D. Baker, Jr, MD, PhD; Jatinder J.S. Bhatia, MD; Frank R. Greer, MD; Melvin B. Heyman, MD; Fima Lifshitz, MD

Liaisons: Donna Blum-Kemelor, MS, RD, US Department of Agriculture; Margaret P. Boland, MD, Canadian Paediatric Society; William Dietz, MD, PhD, Centers for Disease Control and Prevention; Capt. Van Saxton Hubbard, MD, PhD, National Institutes of Health; Susan J. Walker, MD, US Food and Drug Administration

Staff: Pamela T. Kanda, MPH

#### FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

Not stated

#### GUIDELINE STATUS

This is the current release of the guideline.

It updates a previously published guideline summary: American Academy of Pediatrics. Committee on Nutrition. Calcium requirements of infants, children, and adolescents. Pediatrics. 1999 Nov;104(5 Pt 1):1152-7.

All policy statements from the American Academy of Pediatrics automatically expire 5 years after publication unless reaffirmed, revised, or retired at or before that time.

#### GUIDELINE AVAILABILITY

Electronic copies: Available from the [American Academy of Pediatrics \(AAP\) Policy Web site](#).

Print copies: Available from American Academy of Pediatrics, 141 Northwest Point Blvd., P.O. Box 927, Elk Grove Village, IL 60009-0927.

#### AVAILABILITY OF COMPANION DOCUMENTS

None available

#### PATIENT RESOURCES

The following is available:

- Calcium and you: fact for teens. Elk Grove Village (IL): American Academy of Pediatrics.

Copies available for purchase from the [American Academy of Pediatrics online book store](#).

Additionally, a variety of patient and family education resources are available from the [American Academy of Pediatrics Web site](#).

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

#### NGC STATUS

This NGC summary was completed by ECRI on April 3, 2006. The information was verified by the guideline developer on April 11, 2006.

#### COPYRIGHT STATEMENT

This NGC summary is based on the original guideline, which is subject to the guideline developer's copyright restrictions. Please contact the Permissions Editor, American Academy of Pediatrics (AAP), 141 Northwest Point Blvd, Elk Grove Village, IL 60007.

### DISCLAIMER

#### NGC DISCLAIMER

The National Guideline Clearinghouse™ (NGC) does not develop, produce, approve, or endorse the guidelines represented on this site.

All guidelines summarized by NGC and hosted on our site are produced under the auspices of medical specialty societies, relevant professional associations, public or private organizations, other government agencies, health care organizations or plans, and similar entities.

Guidelines represented on the NGC Web site are submitted by guideline developers, and are screened solely to determine that they meet the NGC Inclusion Criteria which may be found at <http://www.guideline.gov/about/inclusion.aspx>.

NGC, AHRQ, and its contractor ECRI make no warranties concerning the content or clinical efficacy or effectiveness of the clinical practice guidelines and related materials represented on this site. Moreover, the views and opinions of developers or authors of guidelines represented on this site do not necessarily state or reflect those of NGC, AHRQ, or its contractor ECRI, and inclusion or hosting of guidelines in NGC may not be used for advertising or commercial endorsement purposes.

Readers with questions regarding guideline content are directed to contact the guideline developer.

© 1998-2006 National Guideline Clearinghouse

Date Modified: 9/25/2006

